A Quick Method for Producing Thin Foils of Aluminum for Electron Microscopy

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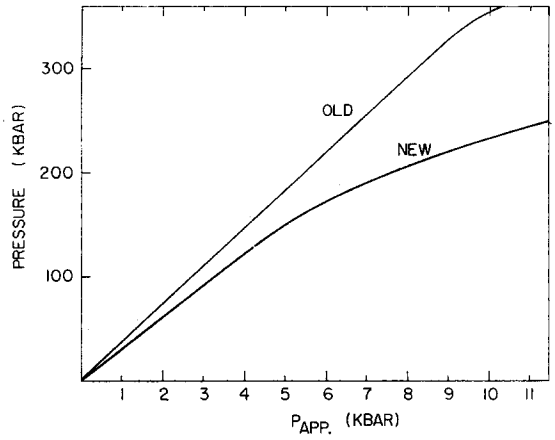

FIG. 2. Calibration for low pressure region. Typical values.

data closely. MgO[8] also gave consistent results to 300 kilobars. The calibration is established as follows: The pressure is a linear function of applied force to 100 kilobars (and substantially linear to 130 kilobars). For higher pressures the change of pressure (from 100 kilobars) vs fractional change in applied pressure is shown in Table I. This was obtained by taking the fractional change in pressure with the fractional change in applied force from the x-ray data to 400 kilobars and extrapolating primarily by assuming the relative pressure is a linear function of the logarithm of the relative applied force at pressures above 400 kilobars. (This condition holds quite well in the range 300–400 kilobars.) Typical curves for the old and new calibration appear in Fig. 1, and the low pressure region is expanded in Fig. 2. The absolute values vary from bar to bar of pyrophyllite, and with the machining and loading technique of the operator. Ranges are indicated in Fig. 1. From a single 15 cm bar of pyrophyllite sufficient pellets can be made for half a dozen low pressure calibrations and high pressure runs.

In Table II appear the old and new pressures obtained from typical calibration curves for a number of transitions. These are not presented as standards. It is of interest to note that the transitions in the low pressure region generally agree reasonably well with recent values obtained in other laboratories.

TABLE II. Approximate location of transitions.

	Old	New
Bi	88	73–75
Fe	133	110–115
Ba	144	118–122
Eu	150–160	122–130
Pb	160	128–132
Rb	190	142–153
Cs[a] (max)	170–180	133–142
Ca[a] (max)	350–375	235–255
Rb[a] (max)	420–435	290–320
CdS[a] (max)	460	320–340
ZnS[a] (max)	550	410–420

[a] Maximum in resistance–pressure curve.

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A Quick Method for Producing Thin Foils of Aluminum for Electron Microscopy

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THE material used for thin foils was 99.99% aluminium. The aluminum was cold rolled to approximately 100 μ and cut into pieces of 2×3 cm. The pieces were treated with acid-proof lacquer in a way that only an area of 2×2 cm on each side of the foil should be attacked by the electrolyte. The process took place in a 400 cm^3 beaker cooled by ice and water. The cathode was a strip of austenitic stainless steel bowed to a cylindrical shell. The diameter of the cylinder was 7 cm. The inner diameter of the beaker was 7.5 cm.

The composition of the electrolyte was 78 ml perchloric acid, 20 ml distillated water, 700 ml ethyl alcohol, and 100 ml butylcellosolve. The most suitable current density was 0.2–0.25 A/cm^2. The temperature of the electrolyte must not exceed 15°C during the thinning process to give good polishing.

The thinning was fairly uniform; however the polishing was a little stronger at the edges of the strip and at the edge of the lacquer; therefore the strip was slowly moved a short distance up and down during the polishing to avoid spoiling of the strip along the edge of the lacquer. During the last part of the process many tiny bits of metal were loosened from the strip. The electrolyte was filtered through a coarse glass filter which then was washed with distillated water and ethyl alcohol. The process of polishing lasted 5–10 min.

It was rather easy to select thin foils with a satisfactory area by suspension of the metal bits in a glass with ethyl alcohol: The pieces which were able to drift in the alcohol for a longer time showed up to be the best thin foils. The drifting thin foils were caught on copper nets and mounted in the specimen holder between two copper nets and examined in a Hitachi HU-11A electron microscope at 100 kV. You had to be careful not to crumple the thin foils during the rinsing of the foils and during the catching on copper nets. Each electrolysis produced five thin foils of good quality on the average. Foils with thin areas smaller than 2000 μ^2 were not accepted. The greatest thin areas obtained were about 20 000 μ^2.

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Crowbar Gap Switch with Two Triggering Pulses of Opposite Polarities and its Simplified Gap Switches

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A CROWBAR gap switch with a new triggering circuit has been designed and tested. Two trigger pulses of opposite polarities are applied simultaneously. Figure 1 shows the circuit of the crowbar gap switch. G_M, C_M, L, and G_c are the start gap switch, the main capacitor (2.2 μF, 30 kV), the load coil (8 μH), and the crowbar gap switch, respectively. E_H, E_E, E_{t1}, and E_{t2} are the high voltage electrode, ground electrode, trigger electrode inserted in the high voltage electrode, and the trigger electrode inserted in the ground electrode, respectively. Each of these electrodes is similar to those of a trigatron

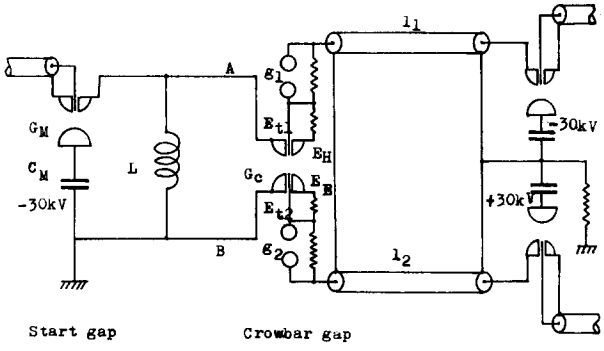

FIG. 1. The circuit of the crowbar gap switch.

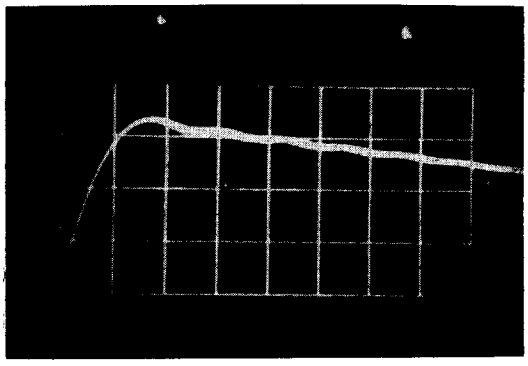

FIG. 2. The current waveform in the load coil with 50 shots superposed. V_c ——30 kV, V_t—±30 kV, I_{max}—15 kA, τ—4.7 μsec, G_c—11 mm, g_1, g_2—10 mm, sweep—5 μsec/div.

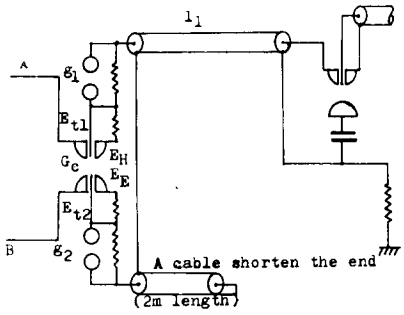

FIG. 3. A simplified crowbar circuit. The results are shown in Fig. 5.

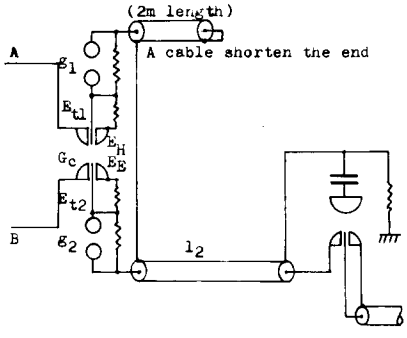

FIG. 4. A simplified crowbar circuit. The results are shown in Fig. 6.

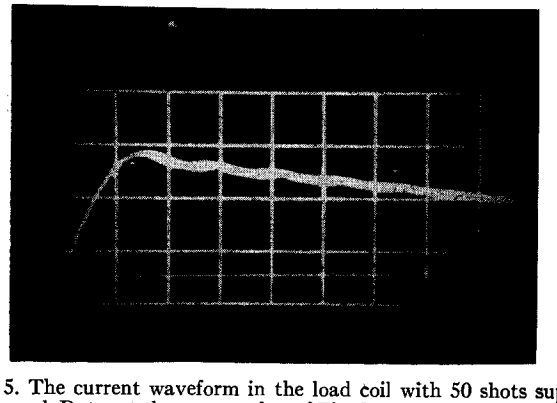

FIG. 5. The current waveform in the load coil with 50 shots superposed. Data are the same as that of Fig. 2, except τ—4.6 μsec.